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(54) IMPROVEMENTS IN OR RELATING TO GOLF CLUBS

(71) We, WILSON SPORTING GOODS Co., of 2233 West Street, River Grove, Illinois 60171, United States of America, a Corporation organized and existing under the laws of the State of Delaware, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention is in the field of wood-type golf clubs having weighting means which move the center of gravity for the club head forward and preferably into the plane which bisects the shaft of the club.

The problem of proper transfer of momentum from a golf club upon its impact with a golf ball is one which has occupied the attention of golf club manufacturers for many years. The magnitude of the problem can be appreciated when it is realized that a golf club head may be moving at a speed in excess of 160 feet per second when it strikes a ball. The time of impact between the golf club and the ball has been estimated to be less than one millisecond so that there is a tremendous amount of energy absorption in a very brief period of time. In order for this transfer of energy to result in an adequate movement of the ball in terms of distance and direction, the effective mass of the club head should be properly positioned with respect to the area of impact on the ball.

Various weighting means have been suggested in the prior art for reallocating the mass of the club head, such weighting means usually taking the form of a heavy metal slug which is located beneath the sole plate in various positions. It has been found, however, that the positioning of weights in this manner does not always result in improving the energy transfer between a golf wood head and the golf ball. Possibly, this is due to the fact that the line of action of the centers of gravity of the ball and the club head are not in line with the theoretical flight path so that an inefficient collision results between the head and the ball.

According to the present invention, a wood-type golf club is provided comprising a club head having a recess in the striking area, an insert filling the recess, a dense weighting member within the insert and a layer of an impact-resistant resin within the insert and holding the weighting member therein, the weighting member being positioned to provide a centre of gravity for the club head which is closer to the leading edge of the club face than in the absence of such weighting member.

The weighting member is preferably positioned so that the centre of gravity is substantially in the plane which bisects the shaft of the club.

According to an especially preferred embodiment of the invention, the weighting member is a disc. Most preferably, the weighting disc is a sintered powered metal disc, consisting predominantly of tungsten. It is an advantageous feature of this embodiment for the resin to cover one face and at least a portion of the periphery of the disc.

According to another preferred feature, the golf club has an annular recess forwardly of the weighting member for anchoring the layer of resin within the recess. Advantageously, an angular taper is provided in the recess for locking the layer of resin within the recess. The golf club may also be provided with an annular groove in the insert between the shallow recess and the striking face for receiving an additional amount of resin, which most suitably is an epoxy resin, to securely lock the impact resistant resin within the insert.

The procedural steps involved in making the improved golf club of the present invention consist of positioning the weighting disc or other form of weighting member about the recess of the insert and adhesively securing the two together. This is followed by pouring in an impact resistant resin into the cavity provided in the recess so that the resin sets and solidifies about the weighting disc confined therein. The resin ex-

pands slightly on setting, so that it completely fills the recess in the insert and is locked in place. This final step consists in grinding or otherwise shaping the striking face of the insert to conform it to the desired radius of the golf club head.

Other features and advantages of the invention will be readily apparent from the following description of certain preferred embodiments thereof, taken in conjunction with the accompanying drawings, in which:

Figure 1 is a fragmentary side elevational view of the improved golf club of the present invention;

Figure 2 is a fragmentary front elevational view of the golf club of the present invention;

Figure 3 is a fragmentary plan view of the golf club head of the present invention;

Figure 4 is an exploded view on an enlarged scale of the insert of the present invention, with the parts being tilted somewhat for showing the configuration more specifically; and

Figure 5 is a fragmentary cross-sectional view on an enlarged scale of the insert of the present invention in the form in which it is received within the golf club head.

In Figure 1, reference numeral 10 indicates generally a golf club of the wood type, the specific club being illustrated being a #1 wood although it will be evident that the invention is also applicable to other wood clubs having different angles of inclination in the striking faces. The golf club 10 may be composed of laminated construction as is common in the prior art and it includes a head 11 having a striking face 12 of relatively large radius of curvature, usually on the order of 10½ inches. Disposed within a suitable wedge-shaped recess in the striking face 12 is a wedge-shaped insert 13 which extends from the sole of the club to the upper portion of the striking face in the conventional manner. A set of grooves 14 is provided across the insert 13 as well as across the adjoining portions of the striking face 12 on either side of the insert 13. The club head 11 also includes a neck portion 15 which is received within a neck collar 16 which also receives, at its opposite end, a shaft 17.

The construction of the insert 13, *per se*, is best illustrated in Figures 4 and 5 of the drawings. As there illustrated, the insert 13 has a relatively deep bore 18 which proceeds inwardly into the insert 13 from the striking face thereof. An annular groove 19 is formed in a medial portion of the bore 18 to serve as an additional locking means for the impact resistant resin which is poured into the bore, as will be apparent from a succeeding portion of this description. Inwardly of the annular groove 19, the bore 18 is outwardly flared as indicated at reference numeral 20 by a few degrees or so to serve as an additional means for locking the impact resistant resin within the bore to resist disengagement of the resin from within the bore.

The innermost end of the bore is formed with a relatively shallow recess 21 and the bore also has an annular flange surface 22. A decorative washer 23 composed of brass or the like is positioned along the annular flange 22 in surrounding relationship to a disc 24 composed of a dense metal such as a sintered, highly dense compact of tungsten alloy powder. The disc 24 is secured over the recess 21 by means of a layer of adhesive 25 disposed in the recess 21 as best illustrated in Figure 5.

After the disc 24 is adhesively secured to the recess 21 by means of the adhesive 25, and the washer 23 is placed therearound, the remaining void space is filled by means of an impact resistant resin layer 26. For purposes of eye appeal, the impact resistant resin may be transparent material such as an epoxy resin or other suitable high impact material such as polycarbonate, a polyester, or a polyamide resin.

In setting, an impact resistant epoxy resin undergoes a slight expansion so that the resin may extend beyond the confines of the striking face of the insert. Any such excess can be removed by grinding, machining, or other means to provide a striking face 27 having a relatively large radius of curvature such as 10½ inches or so. At that time, the grooves 14 can be scribed in the striking face of the resin 26 as well as in the adjoining portions of the club head.

The disc 24 is located immediately behind the proper point of impact on the striking face 27. Referring to Figure 3, if the insert 13 is made of a completely homogeneous material, that is, without the combination of the insert and the impact resistant resin, the center of gravity of the club head will be located at a distance A from the tangent to the leading edge of the club face, as illustrated in that figure. With the improvements of the present invention, however, the center of gravity of the club head lies at a distance B from the leading edge of the club face and is substantially in the plane which bisects the shaft 17.

The positioning of the disc 24 also serves to change the moment of inertia of the club head about its principal axes. These axes are identified in Figures 1 and 3 as the x, y and z axes. The ideal weight distribution would be such as to increase the moment of inertia about the center of gravity in the x—z plane, i.e., in a plane parallel to the ground and passing through the vertical level of the center of gravity of the club head. With such a weight distribution, the club head would be the most stable during

a swing and there would be less tendency to hit off-line shots. The location of the disc 24 in the insert as indicated serves to increase the moment of inertia in this x—z plane, thereby making the club head more stable than a conventional head.

To illustrate the effect of positioning the weighting disc in the center of the face insert, some measurements were made with #1 wood of conventional design. It was found that the center of gravity of the wood club with a conventional insert existed at a point which was $1^{3}/_{16}$ inches from the leading edge of the sole, $\frac{7}{8}$ of an inch vertically from the leading edge, and $^{9}/_{32}$ of an inch behind the axis of the shaft. When the same club was provided with an insert including a tungsten alloy weighting disc $\frac{3}{4}$ of an inch in outer diameter and $\frac{1}{8}$ inch thick, weighing approximately $^{9}/_{16}$ of an ounce, the center of gravity of the club head was found to exist at a point which was $\frac{7}{8}$ of an inch from the leading edge of the sole, $^{13}/_{16}$ of an inch vertically from the leading edge, and only $^{1}/_{32}$ of an inch behind the axis of the shaft.

The movement of the center of gravity of the head has been found to improve significantly the energy transfer between the head of the club and the golf ball when properly struck. The line of action of the centers of gravity of the ball and the club head are more directly in line with the theoretical flight path resulting in a more efficient collision between the club head and the ball. Another advantage is achieved in the combined coefficient of restitution between the ball and the insert. The use of the dense weighting disc in the hitting area increases the amount of energy available in a measurable quantity.

By positioning the weighting disc with its centerline coinciding with the center of the proper hitting area on the striking face, more mass is concentrated in precisely the region in which it does the most good. There is a corresponding lesser tendency to have a component of the impact force at an angle other than normal to the vertical tangent plane of the ball, so that the tendency to hit shots off line is somewhat reduced.

It should be evident that various modifications can be made to the described embodiments without departing from the scope of the present invention.

WHAT WE CLAIM IS:—

1. A wood-type golf club, comprising a club head having a recess in the striking area, an insert filling the recess, a dense weighting member within the insert and a layer of an impact-resistant resin within the insert and holding the weighting member therein, the weighting member being positioned to provide a centre of gravity for the club head which is closer to the leading edge of the club face than in the absence of such weighting member.

2. A golf club according to claim 1, in which the weighting member is positioned so that the centre of gravity is substantially in the plane which bisects the shaft of the club.

3. A golf club according to claim 1 or 2, in which the weighting member is a disc.

4. A golf club according to claim 3, in which the weighting disc is a sintered powdered metal disc, consisting predominantly of tungsten.

5. A golf club according to claim 3 or 4, in which the impact-resistant resin within the insert covers one face and at least a portion of the periphery of the disc.

6. A golf club according to any preceding claim, which includes an annular recess forwardly of the weighting member, for anchoring the layer of resin within the recess.

7. A golf club according to any preceding claim, having an angular taper in the recess for locking the layer of resin within the recess.

8. A golf club according to any preceding claim, in which the resin is an epoxy resin.

9. A golf club according to claim 8, which includes an annular groove in a bore in the insert between the recess and the striking face for receiving the resin in locking engagement.

10. A golf club substantially as hereinbefore described with reference to the accompanying drawings.

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Fig. 1

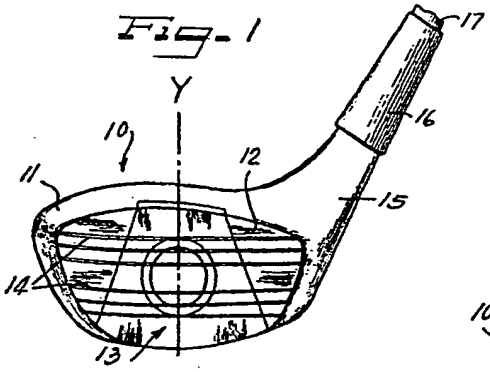

Fig. 2

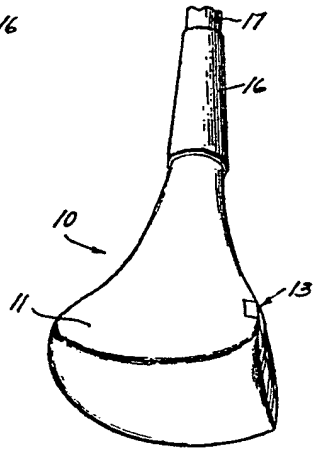

Fig. 3

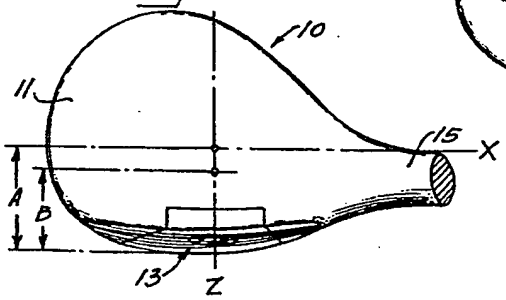

Fig. 5

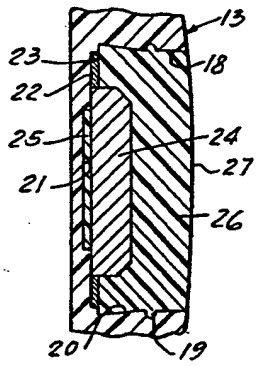

Fig. 4